

bacillus in the tissues; in chapter ii. the characters of the plague bacillus are described with great fulness, and many valuable hints on staining, &c., will be found here. Dr. Klein believes to be erroneous the view of Calmette that passage of the plague bacillus through a series of animals of a species, while increasing its virulence for that species, diminishes the virulence for other species. The statement is made at p. 29 and again at p. 47 that Hankin described long filamentous modifications of the plague bacillus when the organism is grown on salted media, an observation for which Dr. Klein claims priority. But surely what Hankin did describe was the occurrence of large spherical, spindle- and pear-shaped involution forms on salted media (see *Centr. für Bakt.* xxii., p. 438). Here and in some other places references are omitted, and authors' names are sometimes wrongly spelt, e.g. Tidswell for Tidswell, and Simmonds for Simond (p. 154). Chapter iii. deals with the bacteriological analysis of plague material, many valuable practical hints being incorporated, and chapter v. with microbes simulating the plague bacillus. Notable among these are the *Bacterium bristolense* and the *B. myxoides*. The former was isolated from dead rats found on a ship unloading at Bristol, which had come from a plague-infected port. It caused the death of guinea-pigs with a hæmorrhagic septicæmia and enlarged glands, and the bacilli that were present in the lesions were much like the plague bacillus. As a matter of fact, however, cultures showed that the organism was allied to the *B. coli*. The *B. myxoides* was isolated from a case of acute hæmorrhagic febrile disease, which had been notified as possibly one of septicæmic plague. The organism morphologically and in staining properties presented a certain resemblance to *Bacillus pestis*, but it was not pathogenic by subcutaneous inoculation to guinea-pigs and rats, and culturally differed from the plague bacillus. The case was actually one of hæmorrhagic small-pox with a secondary or a terminal infection with this microbe. These examples illustrate the care necessary to diagnose plague bacteriologically. Plague in the rat and in other rodents is discussed in chapters v. and vi. Dr. Klein considers that there may be a type of *B. pestis* occurring in the rat which is less virulent than the ordinary human type. The transmission of plague from one animal to another (chapter vii.) Dr. Klein would ascribe principally to infection by the digestive tract and not to fleas, lice, and other insects, though it must be pointed out that the careful work of Tidswell (Report on the second outbreak of plague at Sydney) and of the Indian Plague Commission (*Journal of Hygiene*, vi., 1906, No. 4) support strongly the latter theory.

Chapter viii. discusses the agglutination reaction and its application to plague; on the whole the test is difficult to apply in this disease, but under certain conditions may be of value. The important subject of preventive inoculation is dealt with in the last chapter but one. The subject of the supposed danger of inoculation during the incubation period is first alluded to, and Dr. Klein remarks that with a prophylactic he has devised there is no risk of this sort. No reference, however, is made to Bannerman's statistics

(*Centr. f. Bakt.*, Abt. i., Bd. xxix., p. 873), which seem completely to remove this objection to the use of the Haffkine prophylactic. As the result of his experiments, Dr. Klein says, "I am prepared emphatically to maintain that 10 c.c. of the Haffkine prophylactic is capable of fully protecting a rat against a subsequent lethal dose of living plague culture." Important testimony this to the protective power of the vaccine when India is decimated with plague and the author of the prophylactic treatment is under a cloud in consequence of an unfortunate accident for which we believe he was in no way responsible! Dr. Klein incidentally confirms much of Haffkine's work on the plague prophylactic.

The most interesting portion of this section is that which deals with the preparation of a new form of vaccine material devised by Dr. Klein which consists of an emulsion of the dried organs of a guinea-pig dead of plague. The drying deprives the plague bacilli of their vitality, and it was found that 10-15 milligrams of the dried organ powder sufficed completely to protect a rat against a lethal dose of plague bacilli. The final chapter is devoted to a consideration of the modes for the destruction of the plague bacillus, and much useful information on the action of disinfection and disinfectants on this organism is included.

The book, which lacks an index, is profusely illustrated with a number of excellent plates, and we congratulate Dr. Klein on the amount and importance of the work he has done with reference to plague and the plague bacillus.

R. T. HEWLETT.

MEMOIRS ON MARINE ANIMALS.

- (1) *Anurida*. By A. D. Imms. Pp. viii+99; 7 plates. 1906. Price 4s.
- (2) *Ligia*. By C. Gordon Hewitt. Pp. viii+37; 4 plates. 1907. Price 2s.
- (3) *Antedon*. By Herbert Chadwick. Pp. viii+47; 7 plates. 1907. Price 2s. 6d. (London: Williams and Norgate.)

THESE volumes, which form the thirteenth, fourteenth, and fifteenth of the Liverpool Marine Biological Committee's memoirs, are comprehensive studies, admirably illustrated by lithographic plates, of animals common on our shores and readily accessible to the student. The authors and the editor, Prof. Herdman, are to be congratulated on the production of such excellent aids to the study of types of our British marine animals.

(1) Mr. Imms's memoir is a well-arranged and detailed account of the interesting Collembolan *Anurida maritima*, which is common on the surface of the quiet shore-pools and in the crevices of the rocks near Port Erin and at other localities on the British coast. In the description of the habits of the animal attention is directed to the covering of hairs, which, when the animal is submerged, retains a supply of air which serves for respiration (there being sufficient to last the insect five days), and also renders the body incapable of being wetted. Chapters follow on the external characters, integument and coloration, mouth parts, digestive, circulatory, nervous, excretory and repro-

ductive systems and embryology. The author has wisely chosen to describe only the general features of the muscular system; a more detailed account would have been beyond the scope of the present memoir. The ventral tube, characteristic of Collembola, present as a papilliform organ on the mid-ventral aspect of the first abdominal segment, is formed, as is shown by development, by the fusion of a pair of appendages. The various functions which have been ascribed to this organ are set forth. The author records his observations in support of the view that its primary function is that of an organ of adhesion, but he also believes that it plays an important part as a respiratory organ, in virtue of the ease with which blood flows into it and distends its two terminal thin-walled vesicles. He confirms on *Anurida* the observations of Willem and Hoffmann on other Collembola, that the secretions of two pairs of cephalic glands flow into a ventral groove leading from the head to the ventral tube, which they serve to moisten. In the chapters on the general structure, classification and affinities of the Collembola, the author concludes that there are no grounds for regarding these animals as degenerate; they show affinities with the Thysanura (especially in having a pair of mouth appendages—the maxillulæ—intercalated between the mandibles and first maxillæ), and, by reason of certain generalised features, to the lower Arthropoda. The memoir also contains additional remarks on other marine insects, and an extensive bibliography relating to papers on the Collembola published since Lord Avebury's monograph.

(2) In selecting *Ligia oceanica* for description as a type of the Isopoda, Mr. Hewitt has made an excellent choice, for not only is this the largest British Isopod, but it is intermediate between the aquatic and terrestrial forms. Although specimens are usually found just above high-water mark, in deep cervices of rocks or quay-walls, the author found them at St. Kilda on the top of a hill 450 feet above sea-level, to which altitude the sea-spray often reaches. It was remarkable that most of the examples found at this height were females, which do not descend to sea-level to feed, but probably do so when liberating the young from their brood-pouches, for large numbers of young individuals were found under the rocks between tide-marks, but none at the high level. Following the description of the habits are clear and concise accounts of the external characters, the various systems of organs, and the development. The eyes are described in some detail. In each ommatidium there are two cone-cells, each of which secretes a hemispherical, transparent mass. These two masses, with their flat sides apposed, form the cone on the proximal side of which the cone-cells further produce two sub-cylindrical accessory cones, an interesting and exceptional feature of the eye of *Ligia*.

(3) The present volume on *Antedon bifida* is Mr. Chadwick's second contribution to this series of memoirs, his previous one, on *Echinus*, having been published in 1900. Detailed and useful descriptions, with excellent figures, are given of the various parts of the skeleton and of the three nervous systems and their functions. The other systems of organs and

the development are well treated. The author is inclined, but without giving reasons, to regard the sacculi as excretory structures; he holds that the view that they consist of reserve material for use in the regeneration of lost or injured parts is discounted by the fact that sacculi are not present in the allied genus *Actinometra*, in which, nevertheless, regeneration proceeds quite as actively as in *Antedon*. The account of the axial organ contains no discussion of the many functions which have been ascribed to it, but the author has observed that, at the breeding season, the epithelial cells lining the tubules of the organ break away and become amœboid, suggesting that at this period, at any rate, the axial organ is a site of formation of amœbocytes.

J. H. A.

A LIFE OF SIR WILLIAM FLOWER.

Sir William Flower. By R. Lydekker, F.R.S. Pp. vii+191. (English Men of Science Series.) (London: J. M. Dent and Co., 1906.) Price 2s. 6d. net.

IT will be long ere the name of William Henry Flower is forgotten by those in this country who are interested in scientific zoology and in the progress and development of zoological museums; and the sketch of his life and work which Mr. Lydekker has put together in the present volume, a small one indeed, though rich in interesting material, will be much valued by those especially who had the advantage of personal acquaintance with the great museum conservator.

As Mr. Lydekker has indicated in his preface, the present work is more devoted to the scientific than to the personal and social side of Sir William Flower's career. Nevertheless, the opening chapter deals with his birth, parentage, education, marriage, general career, and with his lamented death at the age of sixty-seven, in a manner which is both sympathetic and interesting. The remaining seven chapters are devoted to his work as a scientific worker and as a museum conservator or director, and the value of the work which he performed in both capacities is well brought out by the writer of the memoir.

As all zootomists know, Sir William Flower's original work lay almost entirely in the domain of mammalian anatomy and general classification of mammals, and his name will go down to posterity as the discoverer of many new and important facts, and as the propounder of more satisfactory views on many matters of zoological interest. We need only mention his demolition of Owen's classification of mammalia by their brains; his discovery of the fact that in the marsupial dentition only a single pair of teeth on each side is replaced by vertical succession; or his classification of the carnivorous mammalia according to the characters of the base of the cranium. Everyone knows also that Sir William Flower was a first-class authority on the Cetacea, and that in his later years he devoted much attention to anthropological studies.

In the chapters on Sir William's work as conservator of the museum of the Royal College of Surgeons, as director of the Natural History Museum, and on his